## REMARKS

Applicant notes that a personal interview was conducted in this case on February 25, 2004, during which the Examiner and the undersigned counsel discussed the present Application in detail. Applicant would like to thank the Examiner for his helpful comments made during the interview. The amendments and arguments made herein are representative of the Applicant's position as explained in the interview.

This Amendment is filed concurrently with a Request for Continued Examination (RCE) and a Petition and fee for one-month extension of time.

Claims 1-7 and 32-47 are all the claims presently pending in the application. Claims 8-31 have been canceled. Claims 35, 36, 38 and 43-44 have been withdrawn. Claims 1, 6, 32-34, 37-41 have been amended to more particularly define the invention. Claims 45-47 have been added.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicant gratefully acknowledges that claim 4 would be allowable if rewritten in independent form. However, Applicant respectfully submits that all of the claims are allowable.

Claims 1-7, 32-34, 37, and 39-42 stand rejected upon informalities (e.g., 35 U.S.C. § 112, second paragraph). Claims 1, 5, 32-34, 37, and 39-41 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Sunakawa et al. (JP No. 10-312971). Claims 2, 3, 6, and 42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sunakawa et al. in view of Kern et al. (U.S. Patent No. 6,194,742).

These rejections are respectfully traversed in the following discussion.

## I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited in claim 1) is directed to a group III nitride compound semiconductor device which includes a substrate including an upper surface, an undercoat layer formed on the upper surface of the substrate, the undercoat layer being doped

with Mg to form convex portions in an upper surface of the undercoat layer, the convex portions being shaped like a truncated hexagonal pyramid, and group III nitride compound semiconductor layers formed on the undercoat layer.

Conventional devices include an undercoat material and a patterned mask layer of a growth suppressing material formed on the undercoat material. A group III nitride compound semiconductor material is then grown in a window of the mask layer, so that a facet structure is formed in the window (Application at page 1, line 15-page 2, line 18 (citing Japanese Patent Publication No. Hei 10-312971 (e.g., Sunakawa))). However, in such devices, the stress caused by a difference in thermal expansion coefficient and lattice constant between the substrate and the group III nitride semiconductor layer causes these layers to become bowed (Application at page 3, line 12-page 4, line 7).

An exemplary aspect of the claimed invention, on the other hand, includes an undercoat layer which is doped with Mg to form convex portions in an upper surface of the undercoat layer (Application at Figures 7 and 9; page 31, lines 6-21). This allows for stress applied to the "hetero interface" between the group III nitride compound semiconductor layers and the undercoat layer to be distributed and relaxed because the stress is made parallel to inclined surfaces (e.g., sloped portions) by the presence of the inclined surfaces (Application at page 7, line 25-page 8, line 17). Moreover, the claimed invention can be made by a more efficient process than conventional methods (Application at page 9, lines 8-23).

## II. THE 35 U.S.C. 112, FIRST PARAGRAPH REJECTIONS

The Examiner alleges that claims 1-7, 32-34, 37 and 39-42 include subject matter which is not adequately described in the specification.

Applicant submits, however, that claims 1, 32, 34 and 39 have been amended to address the Examiner's concerns.

Therefore, Applicant submits that these claims are fully described and enabled by the specification. Therefore, the Examiner is respectfully requested to withdraw this rejection.

## III. THE PRIOR ART REFERENCES

### A. The Sunakawa, et al. Reference

The Examiner alleges that Sunakawa teaches the claimed invention of claims 1, 5, 32-34, 37 and 39-41. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Sunakawa.

Sunakawa discloses a method which allegedly suppresses the introduction of defects by suppressing cracks generated by difference in the thermal expansion coefficients between a growing III-V compound semiconductor layer and a substrate crystal, and a difference in grid constants. The Sunakawa method includes forming a substrate, limiting a growing region 13 by a mask 14. The facet structure of the group III-V compound semiconductor film 15 is formed by epitaxial growth, for growing the facet structure to cover the mask 14. The facet structure is completely embedded. A group II-V compound semiconductor layer with a flat surface is finally formed (Sunakawa at Figures 3(a)-3(e)).

Applicant submits, however, that Sunakawa does not teach or suggest "*an undercoat layer formed on said upper surface of said substrate, said undercoat layer being doped with Mg to form convex portions in an upper surface of said undercoat layer, said convex portions being shaped like a truncated hexagonal pyramid*", as recited, for example, in claims 1, 32 and 39.

As noted above, unlike conventional devices, the claimed invention includes an undercoat layer which is doped with Mg to form convex portions in an upper surface of the undercoat layer (Application at Figures 7 and 9; page 31, lines 6-21). This allows for stress applied to the "hetero interface" between the group III nitride compound semiconductor layers and the undercoat layer to be distributed and relaxed because the stress is made parallel to inclined surfaces (e.g., sloped portions) by the presence of the inclined surfaces (Application at page 7, line 25-page 8, line 17). Moreover, the claimed invention can be made by a more efficient process than conventional methods (Application at page 9, lines 8-23).

Clearly, these novel features are not taught or suggested by Sunakawa. Indeed, the Application clearly explains the extreme differences between the claimed invention and the Sunakawa device. Moreover, the Application clearly explains how the novel features of the claimed invention make it easier to fabricate than the Sunakawa device. However, the

Examiner surprisingly refuses to acknowledge these clear facts set forth in the Application.

In particular, Sunakawa does not teach or suggest an undercoat layer as in the claimed invention. As noted above, in the claimed invention, an upper surface of the undercoat layer may have convex portions. However, the Sunakawa device includes an undercoat layer 22 having a smooth and level surface (Sunakawa at Figure 3(a)). Thus, the undercoat layer of the claimed invention is clearly different from the undercoat layer 22 of the Sunakawa device.

Moreover, Applicant would respectfully point out that in the Office Action dated December 3, 2004, and during the above-referenced personal interview on February 25, 2004, the Examiner expressly conceded that Sunakawa does not teach or suggest this novel feature.

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggest by Sunakawa. Therefore, the Examiner is respectfully requested to withdraw this rejection.

**B. The Kern, et al. Reference**

The Examiner alleges that Sunakawa would have been combined with Kern to form the claimed invention of claims 2, 3, 6 and 42. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Kern discloses an interfacial layer which is added to a light-emitting diode or laser diode structure to perform the role of strain engineering and impurity gettering. A layer of GaN or Al.sub.x In.sub.y Gal.sub.1-x-y N (0.ltoreq.x.ltoreq.1, 0.ltoreq.y.ltoreq.1) doped with Mg, Zn, Cd can be used for this layer. Alternatively, when using Al.sub.x In.sub.y Ga.sub.1-x-y N (x>0), the layer may be undoped. The interfacial layer is deposited directly on top of the buffer layer prior to the growth of the n-type (GaN:Si) layer and the remainder of the device structure (Kern at Abstract).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems and solutions. Specifically, Sunakawa is directed to a method which suppresses defects by forming faceted portions of a group III-V compound semiconductor layer in the windows of a patterned mask, whereas Kern is directed to a method which forms an interfacial layer 16 on a buffer layer 14 (Kern at Figure 3). Therefore, these references are completely unrelated, and

no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, nowhere do the references include any a suggestion or motivation to combine the references as alleged by the Examiner. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, Applicant submits that neither Sunakawa, nor Kern, nor any combination thereof, teaches or suggests "*an undercoat layer formed on said upper surface of said substrate, said undercoat layer being doped with Mg to form convex portions in an upper surface of said undercoat layer, said convex portions being shaped like a truncated hexagonal pyramid*", as recited, for example, in claims 1, 32 and 39.

As noted above, unlike conventional devices, the claimed invention includes an undercoat layer which is doped with Mg to form convex portions in an upper surface of the undercoat layer (Application at Figures 7 and 9; page 31, lines 6-21). This allows for stress applied to the "hetero interface" between the group III nitride compound semiconductor layers and the undercoat layer to be distributed and relaxed because the stress is made parallel to inclined surfaces (e.g., sloped portions) by the presence of the inclined surfaces (Application at page 7, line 25-page 8, line 17). Moreover, the claimed invention can be made by a more efficient process than conventional methods (Application at page 9, lines 8-23).

Clearly, these novel features are not taught or suggested by Kern. Indeed, as noted above, Kern merely discloses an interfacial layer 16 formed on a nucleation layer 14. Kern clearly does not teach or suggest an undercoat layer as in the claimed invention. Nowhere does Kern teach or suggest such a layer. Thus, Kern certainly does not teach or suggest that undercoat layer which is doped with Mg to form convex portions in an upper surface of the undercoat layer. Therefore, Kern clearly does not make up for the deficiencies in Sunakawa.

The Examiner attempts to rely on Figure 3 and col. 3 in Kern to support his position. However, nowhere does Figure 3 or col. 3 teach or suggest doping with Mg **to form convex portions in an upper surface of an undercoat layer**. Instead, Kern merely discloses

doping an interfacial layer 16. The layer 16 allegedly "increases device reliability and reproducibility by "gettering" or trapping the residual impurities, e.g., oxygen, in the initial layer of the structure" (Kern at col. 3, lines 59-61). Thus, Kern explains that the dopants are selected because these dopants "have a high affinity for oxygen" (Kern at col. 3, line 67-col. 4, line 1).

Thus, Kern expressly states that the dopants in the interfacial layer have a completely different purpose than those in the claimed invention. In particular, nowhere does Kern teach or suggest doping an undercoat layer to form convex portions. Therefore, Kern clearly does not make up for the deficiencies in Sunakawa.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

## IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-7 and 32-47, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 7/31/04

Phillip E. Miller, Esq.
Registration No. 46,060

**McGinn & Gibb, PLLC**
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
**Customer No. 21254**